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AMENDMENT TO THE SPECIFICATION:

Please replace paragraph [0018] with the following paragraph:

[0018] Referring now to Figure 1, a catalytic converter system generally designated 100 is illustrated. System 100 comprises an upstream catalytic converter 10 and a downstream catalytic converter 12. Preferably, the upstream converter 10 is a close-coupled converter, while the downstream converter 12 is preferably an under-floor catalytic converter. The terms "close-coupled" and "under-floor" are used to describe the location of a catalytic converter in system 100. Those skilled in the art generally use at least the following three terms to describe the location of a catalytic converter: manifold mounted, close-coupled, and under-floor. Manifold mounted is directly connected to the manifold outlet of an engine; ~~closed-coupled~~ close-coupled is located in the engine compartment of a vehicle (e.g., less than or equal to 200 millimeters (mm) from the manifold outlet); and under-floor is located the farthest away from the engine located under the floor region of a vehicle (e.g., greater than or equal to 1,200 mm from the manifold outlet).

Please replace paragraph [0019] with the following paragraph:

[0019] Upstream converter 10 comprises a housing 18 with a retention material 16 disposed between the housing 18 and a catalytic substrate 14, wherein the retention material 16 may be a material wrapped around the catalytic substrate 14 forming a subassembly. An arrow labeled "flow direction" schematically illustrates the general flow direction of exhaust in system 100. Exhaust fluid is allowed to enter the upstream converter 10 through an inlet 24 in ~~endplate~~ end plate 22. Exhaust fluid enters opening 24, passes through substrate 14, and exits an opening 26 of an ~~endcone~~ end cone 28. However, in other embodiments, ~~endcone~~ end cone 28 may be an end plate (not shown). Opening 26 is sized to receive exhaust conduit 30, which is in fluid communication with downstream catalytic converter 12.

Please amend paragraph [0020] with the following paragraph:

[0020] Downstream converter 12 is in fluid communication with upstream converter 10 via exhaust conduit 30. Downstream converter 12 comprises a catalytic substrate 32 optionally wrapped in a retention material 34 forming a subassembly, which is encased in a housing 36. An ~~end-cone~~ end cone 38 has an opening 40 sized to receive exhaust conduit 30. Exhaust fluid enters ~~end-cone~~ end cone 38 through opening 40, passes through substrate 32, an exists through a second ~~end-cone~~ end cone 42 having an opening 44 sized to receive outlet exhaust conduit 46.

Please amend paragraph [0022] with the following paragraph:

[0022] As will be discussed in greater detail, several design features/variables have been discovered to impart this advantageously fast light-off time. For example, design variables include, but are not limited to, the location of the converter (e.g., close-coupled), the shape of the catalyst substrate (e.g., rounded), the catalyst distribution in the catalyst substrate (e.g., substantially distributed near the core of the catalyst substrate), the use of an end plate instead of an ~~endcone~~ end cone at the inlet to the converter, the size of the exhaust conduit and the substrate, and/or the angle at which the exhaust conduit is attached to the end plate.

Please amend paragraph [0025] with the following paragraph:

[0025] It is noted that all else being equal, a rounded catalyst substrate provides for faster light-off compared to other shaped catalyst substrates, e.g., oval. Without being bound to theory, the rounded catalyst substrate allows for laminar flow at least through a portion of the catalyst substrate, whereas an oval substrate creates turbulent flow regardless of the shape of an ~~end-cone~~ end cone or end plate, and the thermal transfer through the substrate is not substantially uniform in an oval substrate.

Please amend paragraph [0033] with the following paragraph:

[0033] Upstream converter 10 employs ~~endplate~~ end plate 22 or similar device that forces the exhaust fluid flow through the center/core of substrate 14, where the catalyst is

substantially located. In contrast, an ~~end cone~~ end cone would distribute fluid flow over the entire substrate, which results in slower light-off times compared to a converter employing the ~~endplate~~ end plate.

Please amend paragraph [0034] with the following paragraph:

[0034] In addition to having the flow volume through the substrate established to attain the desired light-off characteristics, the upstream converter (i.e., the converter fluidly disposed between the engine and the downstream converter) is preferably also designed to have a laminar flow from the engine through the substrate. Therefore, an angle θ of about 90° (e.g., about 80° to about 100°) between the ~~endplate~~ end plate face and the conduit 20 to the engine is preferred (see Figure 1). As a result, an ~~endplate~~ end plate is preferably disposed at the inlet end with the substrate comprising a catalyst concentration gradient such that the concentration of catalyst in the laminar flow area is greater than or equal to 60 wt % of the total weight of the catalyst, the substrate is located sufficiently close to the end plate to maintain laminar flow therethrough (e.g., located at a distance "d" of less than or equal to 10 mm), and the angle between the ~~endplate~~ end plate and the conduit is preferably 90° +/- 5°.

Please amend paragraph [0035] with the following paragraph:

[0035] In one embodiments, the exhaust conduit 20 can extend past the ~~endplate~~ end plate 22 by about 3 millimeters (mm) to about 10 mm, with about 3 mm to about 7 mm preferred. Further, the end of inlet exhaust conduit 20 is preferably disposed less than or equal to 15 mm away from the upstream catalyst substrate, with less than or equal to 10 mm away from the upstream catalyst substrate preferred, and less than or equal to 5 mm away from the upstream catalyst substrate more preferred.

Please amend paragraph [0039] with the following paragraph:

[0039] In an exemplary embodiment, the downstream converter is designed to create a turbulent flow such that the exhaust fluid is distributed throughout the converter and not

merely through the core. Consequently, an end cone is preferably employed at the downstream converter inlet and/or the substrate 32 is located a sufficient distance from the end cone to induce a turbulent fluid flow. In this figure, downstream converter 12 comprises ~~endcone~~ end cone 38, which cause turbulent flow over substrate 32 allowing for exhaust fluid to be dispersed over the entire substrate. Although downstream converter 12 may have any size or shape, downstream converter 12 preferably has a size and shape substantially the same as substrate 32, which may have any shape, for example, oval or round. Preferably, substrate 32 has an oval or otherwise elongated shape in the direction perpendicular to the flow to further induce turbulence. Substrate 32 has catalyst substantially dispersed throughout, i.e., greater than or equal to 60 wt% of the catalyst is preferably dispersed at the bulk of substrate, with greater than or equal to 80 wt% preferred. As such, substrate 32 allows for better steady state performance compared to substrate 14. Substrate 32 may obtain this catalyst dispersion by disposing the catalyst on the substrate and drying, e.g., in an oven.

Please amend paragraph [0040] beginning on page 10 as follows:

[0040] In various embodiments, the downstream converter 12, is designed to attain a turbulent flow upstream of the catalytic substrate 32. For example, the exhaust conduit 30 can extend past ~~endcone~~ end cone 38 a distance to allow turbulent flow in the downstream converter 12. For example, the exhaust conduit 30 extends beyond the ~~endcone~~ end cone 38 a distance less than or equal to 10 mm, with less than or equal to 5 mm preferred, and about 0 mm more preferred.

Please amend paragraph [0042] with the following paragraph:

[0042] Referring now to Figure 2, a catalytic converter system generally designated 200 is illustrated. In this embodiment, ~~no closed coupled~~ no close-coupled converter is employed. Rather, the various design features that are disclosed herein are incorporated into a single package, which is an under-floor converter. Converter system 200 comprises an upstream substrate 202 and a downstream substrate 204 having a gap 206 disposed between the upstream

substrate and the downstream substrate. A retention material 208 is disposed between the housing 210 and the downstream substrate 204, and gap 206. An ~~endplate~~ end plate 212 having an opening 214 is coupled to housing 210 at an inlet side. An ~~end-cone~~ end cone 218 is coupled to housing 210 at an outlet side.

Please amend paragraph [0043] with the following paragraph:

[0043] An arrow labeled "flow direction" schematically illustrates the general flow direction of exhaust in system 200. Exhaust fluid enters system 200 through opening 214 of ~~endplate~~ end plate 212 from exhaust conduit 216, which is coupled to ~~endplate~~ end plate 212 at an angle 0 of about 90-degree from the face of ~~endplate~~ end plate 212, allowing laminar flow in upstream substrate 202. Gap 206 between upstream substrate 202 and downstream substrate 204 is sufficient to create turbulent flow in the exhaust fluid prior to entering substrate 204. While gap 206 may be any size sufficient to cause turbulent flow, a gap 206 of less than or equal to 30 millimeters (mm) is preferred, with about 10 mm to about 20 mm more preferred. The exhaust fluid then enters substrate 204, and eventually exists system 200 through ~~end-cone~~ end cone 218 having opening 220 in fluid communication with exhaust conduit 222 as with converters 10 and 12, the end piece of this converter 200 can be an end plate or end cone. However, end cones are preferred at the outlet to facilitate flow out of the converters and avoid dead flow areas. Compared to the system embodied in Figure 1, the system embodied in Figure 2 has the advantage of being packaged in a single housing. As such, a cost savings may be recognized. More particularly, one end plate, and one end cone are employed instead of four end pieces. Additionally, less retention material may be used, and less process time may be realized as result of a reduction in welding time. However, these advantages may be outweighed in some instances where a slower resulting light-off time is achieved, compared to the light-off time of a separate close-couple converter disclosed herein.

Please amend paragraph [0050] with the following paragraph:

[0050] Additionally, ~~end-cones~~ end cones (e.g., 38, 42, 218), ~~endplates~~ end plates (e.g., 22, 212), and the like may comprise material similar to those used for the housing. These components may be formed separately (e.g., molded or the like), or may be formed integrally with the housing using methods such as, e.g., a spin forming, or the like.

Please amend paragraph [0055] with the following paragraph:

[0055] The "tourniquet" method of forming the catalytic converter comprises wrapping the shell (e.g., in the form of a sheet) around the retention material/substrate subassembly. The adjoining edges of the shell are welded together while the assembly is squeezed at rated pressures calculated to optimize the retention material density. The ~~end-cones~~ end cones/~~end-plates~~ end plates or the like, are then welded to the shell to form the converter. Although this method also has the disadvantages of increased cost due to the number of components that have to be processed and the added cost of welding wires and gases, it claims improved retention material density control.

Please amend paragraph [0056] with the following paragraph:

[0056] In any of the above methods, the ends of the housing may be sized, e.g., using a spinform method, to form a conical shaped inlet and/or a conical shaped outlet, thus eliminating the need for separate end cone assemblies in at least one embodiment. For example, this method may be particularly useful for converter 12. In the alternative, one or both ends of the shell may also be sized so that an ~~endcone~~ end cone and an end plate may be attached to provide a gas tight seal. This method is particularly useful, for example, in catalytic converter 200, which comprises both end plate 212 and ~~end-cone~~ end cone 218.

Please amend paragraph [0058] with the following paragraph:

[0058] Hydrocarbon emissions were studied as a function of substrate shape, ~~endplate~~ end plate and end cone configurations, and catalyst distribution. These results are

summarized in Figure 3, which is graph of hydrocarbon emissions release weight in grams (wt. g/mi) per mile as a function of time. The following eight configurations were studied: (1) a converter comprising a round shape substrate with catalyst substantially (e.g., greater than or equal to 60 wt%) distributed at the bulk of the substrate and employing end cones; (2) a converter comprising a round shaped substrate with catalyst substantially distributed at the core and employing ~~endcones~~ end cones; (3) a converter comprising an oval shaped substrate with catalyst substantially distributed at the bulk of the substrate and employing end plates; (4) a converter comprising an oval shaped substrate with catalyst substantially distributed at the core and employing end plates; (5) a converter comprising an oval shaped substrate catalyst substantially distributed at the bulk of the substrate and employing ~~endcones~~ end cones; (6) a converter comprising an oval shaped substrate with catalyst substantially distributed at the core and employing ~~endcones~~ end cones; (7) a converter comprising a round shaped substrate with catalyst substantially distributed at the bulk of the substrate and employing end plates; (8) a converter comprising a round shaped substrate with catalyst substantially distributed at the core and employing end plates.

Please amend paragraph [0060] beginning on page 16 as follows:

[0060] A ~~closed couple~~ close-coupled converter (e.g. 10) may comprise an upstream substrate and a downstream substrate. The combined length of the upstream substrate and the downstream substrate is preferably less than or equal to 6 inches (about 15.24 cm). However, the substrates may be arranged in any combination. For example, the upstream substrate and the downstream substrate may both be 3 inches (about 7.62 cm) or the upstream substrate may be two inches (about 5.08 cm) and the downstream substrate may be 4 inches (about 10.16 cm). In this example, the upstream substrate has a catalytic metal (e.g., platinum group metals) concentration of greater than or equal to 2 times the catalytic metal per cubic inch as the downstream substrate, i.e., at least two-thirds of the platinum group metals employed in the converter are preferably disposed on the upstream substrate. Preferably, a gap of less than or equal to 2 millimeters (mm) is disposed between the two substrates, wherein the gap is greater than 0 mm. If the gap is 0 mm, i.e., there is no gap, the brick faces can rub together, fracture and plug the inlet of the downstream substrate.